

REMARKS

Claims 1-16 are currently pending in the application. Claims 1, 13 and 16 are the pending independent claims.

In the outstanding Office Action, the Examiner finally rejected claims 1-8 and 13-16 under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. Patent 6,091,110 issued to Hebert et al. (hereinafter "Hebert") in view of U.S. Patent 6,162,665 issued to Zommer (hereinafter "Zommer") and S. Savastiouk et al., "Atmospheric Downstream Plasma," (hereinafter "Savastiouk"). Applicants respectfully submit that Hebert, Zommer and Savastiouk, even if combinable, collectively do not teach each and every limitation of these claims.

The combined teachings of Hebert, Zommer and Savastiouk do not teach or suggest a stress compensation layer with a tensile stress sufficient to counterbalance at least a portion of an overall residual stress of a power transistor device attributable, at least in part, to a thinning of a substrate of the device, a limitation present in each of independent claims 1, 13 and 16.

In the Office Action, the Examiner stated, on page 2, 4th paragraph, that "Hebert does not disclose thinning of the substrate or that the overall stress is attributable at least in part to the thinning step." However, the Examiner alleged that Zommer discloses changing the thickness of the substrate using techniques that are "known to introduce damage that will alter the residual stress [as according to Savastiouk]." *Id.* The Examiner further alleged that Hebert recites "that the layer is a 'stress relief dielectric layer,' and residual stress is therefore, compensated" (emphasis omitted). See, Office Action, page 6, 3rd paragraph.

Based on the above, the Examiner concluded that "it would have been obvious to one of ordinary skill in the art at the time of the invention to use the procedures of Zommer in Hebert to obtain a backsurface thinned substrate with altered resistivity and breakdown voltage." See, Office Action, page 3, 1st paragraph.

However, nothing in the combined teachings of the references in any way indicates that the dielectric layer of Hebert would have a tensile stress sufficient to counterbalance any amount of overall residual stress resulting from substrate thinning. For example, Hebert contains no teachings whatsoever regarding the purpose, function or any other substantive property of the

oxide stress compensation layer. In fact, it appears from the limited teachings of Hebert that the stress compensation layer is merely present to compensate stresses inherent in layers adjacent thereto. For example, Hebert, at col. 2, beginning on line 54, teaches that the plasma enhanced CVD oxide layer (e.g., the stress relief layer) is deposited prior to a thick inter level dielectric being formed over it and the device being heated.

The Examiner seems to be taking the teachings of Hebert which, according to the Examiner's analysis, disclose a stress relief layer, and the teachings of Zommer which, according to the Examiner's analysis, disclose thinning of a substrate, and concluding that the layer in Hebert would be sufficient to counteract stress should thinning of the device in Hebert be performed as is taught in Zommer. This conclusion finds absolutely no support in any of the cited teachings, absent use of the teachings of the present application as a guide.

Further, one of ordinary skill in the art would not arrive at such a conclusion for at least the reason that, as will be discussed below, there exists no motivation to combine the teachings of Hebert, Zommer and Savastiouk. Also, since the combined references do not in any way address counterbalancing stress from substrate thinning, one of ordinary skill in the art would find no guidance on this subject from the cited references.

In the Office Action on page 4, 3rd paragraph, the Examiner stated, with regard to independent claims 13 and 16, that "[i]t would have been obvious . . . to combine Sherman with Hebert to obtain a film having tensile stress to relieve residual stress within the device." However, neither independent claim 13 nor independent claim 16 is being rejected over Hebert in view of Sherman. Clarification is thus respectfully requested. Regardless, however, independent claims 13 and 16 are patentable over the cited references for at least the reasons stated above.

Regarding claims 2-8 and claims 14 and 15, Applicants respectfully submit that these claims are allowable at least by virtue of their dependence from independent claims 1 and 13, respectively, for the reasons identified above. However, these claims define additional separately patentable subject matter for the reasons identified below.

For example, with regard to claim 7, this claim calls for the steps of thinning the substrate and applying a stress compensation layer to be performed repeatedly until a desired curvature is

attained. The Examiner claimed that "Hebert and Zommer disclose . . . that the thinning of the substrate and application of a stress compensation layer produces a curvature of the device." See Office Action, page 3, 6th paragraph. The Examiner then concluded that "the 'repeated' application would also produce a curvature and is therefore rejectable using the same criteria." See *Id.* Applicants respectfully submit that these statements are incorrect. Hebert and Zommer do not disclose that thinning of the substrate would produce a curvature of the device as the Examiner contends. As presented above, Hebert doesn't disclose curvature in a device or thinning of the substrate of a device. Zommer similarly makes absolutely no mention of curvature in a device. Since neither Hebert nor Zommer are related to device curvature, it is implausible to find that they would in any way relate to attaining a desired curvature.

As mentioned above, Applicants respectfully submit that there exists no motivation to combine the teachings of Hebert with those of Zommer and Savastiouk. With regard, for example, to the proposed combination of Hebert and Zommer, the Examiner stated that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to use the procedures of Zommer in Hebert to obtain a backsurface thinned substrate with altered resistivity and breakdown voltage." Office Action, page 3, 1st paragraph (appearing again beginning on page 4, 4th paragraph). The Examiner further concluded by reference to U.S. Patent 6,816,011 issued to Paul et al. (hereinafter "Paul") that "a higher breakdown voltage" (as allegedly achievable by the techniques of Zommer) is desirable. See, for example, Office Action, page 7, 4th paragraph.

Applicants disagree and respectfully submit that one of ordinary skill in the art would not be motivated to supplement the teachings of Hebert with those of Zommer to achieve "a higher breakdown voltage," as the Examiner suggests, as it would be difficult to ascertain what actual breakdown voltage is present in Hebert and thus whether a relatively 'higher' breakdown voltage would even be desirable. For example, Hebert contains no substantive teachings regarding the substrate layer, e.g., P+ substrate layer 10 in FIG. 1. Therefore, it is the Applicants' position that one of ordinary skill in the art would not be motivated to combine the teachings of Hebert with those of Zommer.

As stated in Applicants' previous response, the Examiner seems to have misconstrued the teachings of Hebert in making the instant rejections. Specifically, on page 2, 3rd paragraph, of the Office Action, the Examiner stated that "Hebert discloses a method for controlling the curvature . . . of a device." (internal citations omitted). Applicants respectfully disagree. Nowhere does Hebert disclose curvature, or controlling curvature in a device.

The Examiner argued that that the recitation of "controlling curvature" is in the preamble of independent claim 1, and thus should not be "accorded any patentable weight." See, Office Action, page 7, 2nd paragraph. First, Applicants respectfully submit that whether this assertion is correct or not, the Examiner still has misconstrued the teachings of Hebert to imply non-existent teaches regarding curvature.

Notwithstanding the above, Applicants respectfully submit that according to M.P.E.P. §2111.02, a claim preamble "must be read in the context of the entire claim." By way of example only, in independent claim 1, the steps of thinning and applying are conducted to control the curvature of the power transistor device. It is also notable that the phrase "curvature of the device" provides antecedent basis for limitations present in the dependent claims. See, for example, claim 9.

The Examiner further stated, in the Office Action, on page 7, 3rd paragraph, that "it is notoriously well known that the deposition of a thin film oxide layer will cause a 'bending' or curvature." The Examiner makes reference to U.S. Patent No. 6,531,193 issued to Fonash et al. (hereinafter "Fonash"). Applicants, however, respectfully point out that with the lack of any specifics in Hebert regarding, e.g., the thickness of P+ substrate 10, it cannot be assumed, with any degree of certainty, that curvature occurs. For example, it is equally plausible, given the teachings in Hebert, that the P+ substrate is of a thickness such that no curvature is experienced.

The Examiner also finally rejected claims 9-12 under 35 U.S.C. §103(a) as allegedly unpatentable over Hebert in view of, Zommer, Savastiouk and A. Sherman, "Chemical Vapor Deposition for Microelectronics," (hereinafter "Sherman"), and further in view of Wilson et al., "Handbook of Multilevel Metallization for Integrated Circuits," (hereinafter "Wilson").

In making the instant rejections, the Examiner stated that "[c]laims 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hebert in view of Sherman, Zommer, and

Savastiouk et al., as applied to Claims 1-8, and 13-16” (emphasis added). See Office Action, page 5, 3rd paragraph. Applicants point out however, that no rejections of claims 1-8 and 13-16 were made over Sherman. As such, this reference to Sherman is presumed to have been made in error. Clarification is respectfully requested.

Applicants respectfully traverse the Examiner’s rejections. As presented above, independent claim 1, from which claims 9-12 ultimately depend, is patentable over Hebert in view of Zommer and Savastiouk. Applicants presume that, as stated above, the reference to Sherman was made in error. Therefore, for at least that reason, claims 9-12 are also patentable. However, these claims define additional separately patentable subject matter.

For example, claim 10 recites that the stress compensation layer maintains the curvature of the device. The proposed combination of references fails to teach this limitation. Specifically, as presented above, Hebert, Zommer and Savastiouk do not, in any way, relate to device curvature. Further, as Applicants pointed out in their previous response, Wilson is directed to determining the amount of bend experienced as a result of the stresses in a deposited thin film. Specifically, Wilson teaches simply “measuring the change in wafer curvature before and after the film deposition.” Wilson, page 223, 2nd paragraph (emphasis added). Therefore, Wilson has absolutely nothing to do with controlling and/or maintaining, in any way, the curvature of a device.

On this point, the Examiner further stated, in the Office Action, beginning on page 7, 5th paragraph, that Wilson “provides a basis for instrumentally measuring (Eq. 14) the radius of curvature, using optimization to determine film thickness.” Applicants, however, fail to see how this in any way applies to controlling and/or maintaining curvature of a device.

In view of the foregoing, the invention, as claimed in claims 1-16, cannot be said to be taught or suggested by the collective teachings of the cited references. Accordingly, Applicants submit that all of the pending claims are in condition for allowance and such favorable action is earnestly solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

As indicated previously, a Notice of Appeal is submitted concurrently herewith.

Respectfully submitted,



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